

B.E/B.TECH. DEGREE EXAMINATION – MODEL QUESTION PAPER - I

Sixth semester

Mechanical Engineering

ME8593 - COMPUTER AIDED DESIGN AND MANUFACTURING

(Regulation 2017)

Time: Three hours

Answer ALL questions

Maximum: 100 marks

Part A - (10 × 2 = 20 Marks)

1. What is concurrent engineering?

Concurrent engineering is a methodology of restructuring the product development activity in a manufacturing organization using a cross functional team approach.

2. Differentiate between utilization and availability.

- (i) **Utilization** of the production facility (U) is the ratio of the number of parts made by the production facility relative to its capacity.
- (ii) **Availability** is a measure of reliability for equipment and is usually expressed as a percentage.

3. Write the equation of a circle in parametric form.

A circle with its center at the origin and radius = 1 can be written in implicit form given by

$$f(x, y) = x^2 + y^2 = 0$$

or in parametric form given by

$$x, y = f(\theta) = \cos \theta, \sin \theta.$$

where θ is the parametric variable.

4. What is use of surface patch?

Surface patches are analogous to the multiple polynomial arcs used to build a spline. Surface Patch feature is used to fill gaps in surface bodies in ANSYS Design Modeler.

5. Compare the shape based and the product data based exchange standards.

S. No.	Shape based exchange standards	Product data based exchange standards
1.	All data exchange files are neutral files.	It has specific file formats.

2.	It has sections of header, table, block, entities and end	It consists of a three layered architecture such as application, logical and physical layers.
3.	These files do not have any software specific function.	These files must have any software specific function.
4.	Example, DXE & IGES	Example, STEP, SDF, EDIF and PDES.

6. What is GKS cell array?

GKS cell array function displays raster like images in a device-independent manner. It takes two corner points of a rectangle in which M number of divisions in X direction and N number divisions in Y directions. So, the rectangle is portioned into $M \times N$ sub rectangles called cell array.

7. Name the various elements of CNC machines.

- Part program
- Program input device
- Machine control unit
- Machine tool
- Driving system
- Feedback devices
- Display unit.

8. List the differences between NC and CNC.

S. No.	NC system	CNC system
1.	NC system uses electronic hardware based on digital circuits.	CNC system employs a mini or microcomputer to control machine tools.
2.	The part program is fed to the machine through the tapes or other such media.	In CNC system, the program is fed to the machine through the computer.
3.	In order to modify the program, the tapes have to be changed.	The programs can be easily modified with the help of computer.

4.	In NC machine tool system, tape reader is a part of machine control unit.	The microprocessor or minicomputer forms the machine control unit. The CNC machine does not need tape reader.
5.	System has no memory storage and each time it is run using the tape.	It has memory storage ability, in which part program can be stored.
6.	It cannot import CAD files.	System can import CAD files and convert it to part program.
7.	It cannot use feedback system.	The system can use feedback system.
8.	The NC systems are not software driven.	The CNC systems are software driven.

9. What is a composite part?

A composite part is a hypothetical part which includes all of the design and manufacturing attributes of a family. The composite is a single hypothetical part that can be completely processed in a manufacturing cell.

10. List any four advantages of implementing FMS.

- (i) Increased machine utilisation
- (ii) Reduced inventory
- (iii) Reduced manufacturing lead time
- (iv) Greater flexibility in production scheduling.

Part B - (5 × 13 = 65 Marks)

11. (a) Explain the various graphic transformations required for manipulating the geometric information.

Refer chapter 1.8 in Page 1.25.

Or

(b) The average part produced in a batch manufacturing plant must be processed sequentially through six machines on average. Twenty new batches of parts are launched each week. Average operation time = 6 min., average set up time = 5 hours, average batch size = 36 parts, and average non-operation time per batch = 10 hrs/machine. There are 18 machines in the plant working in parallel. Each of the

machines can be set up for any type of job processed in the plant. The plant operates an average of 70 production hours per week. Scrap rate is negligible. Determine manufacturing lead time for an average part, plant capacity and plant utilization.

Refer problem 1.22 in Page 1.185.

12. (a) (i) Explain the different features of a Bezier curve with construction details. (6)

Refer chapter 2.3.3 in Page 2.19.

- (ii) What is B-spline surface? And explain it. (7)

Refer chapter 2.14 in Page 2.69.

Or

(b) Sketch the CSG tree for each of the two solids shown below. The solid S_2 is divided symmetrically and it consists of four blocks (B_1 to B_4) and six cylinder (C_1 to C_6). The dashed line shown inside S_2 in the Figure Q1 is not part of S_2 . It is a hypothetical line that uses to divide the top part of S_2 into two blocks B_1 and B_2 .

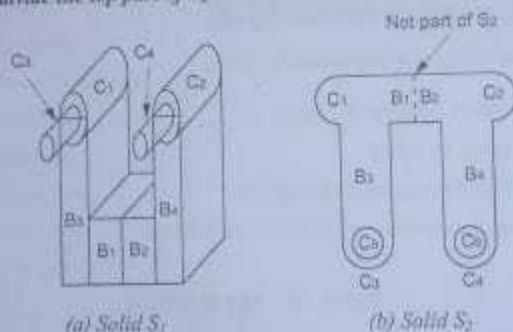


Figure Q1

Same as AU Problem 2.3 in Page 2.82.

13. (a) List and discuss the major available modules in CAD software packages.

Refer chapter 3.4 in Page 3.5.

Or

- (b) Explain the concept of Product Data Exchange using STEP in detail.

Refer chapter 3.10 in Page 3.51.

14. (a) (i) Discuss the different data input devices of NC machine tool.

(4)

Refer Page 4.13.

- (ii) Discuss about the straight cut system and continuous system with a neat sketch and with suitable example.

(9)

Refer chapter 4.2.7.1 in Page 4.17 for straight cut system and chapter 4.2.7.2 in Page 4.18 for contour system.

Or

- (b) Describe the drive systems used in CNC machine tools.

Refer chapter 4.3.12 in Page 4.46 for spindle drives in CNC machines and chapter 4.3.13 in Page 4.54 for feed drive in CNC machines.

15. (a) Briefly discuss the various benefits of implementing a GT in a firm. Also bring out the advantages and limitations of using GT.

Refer chapter 5.11 in Page 5.32.

Or

- (b) Explain the bottleneck model and the associated operational parameters and performance measures.

Refer chapter 5.26 in Page 5.80.

Part C - (1 × 15 = 15 Marks)

16. (a) Write CNC part program for the component shown in Figure Q2. Mention the assumptions made.

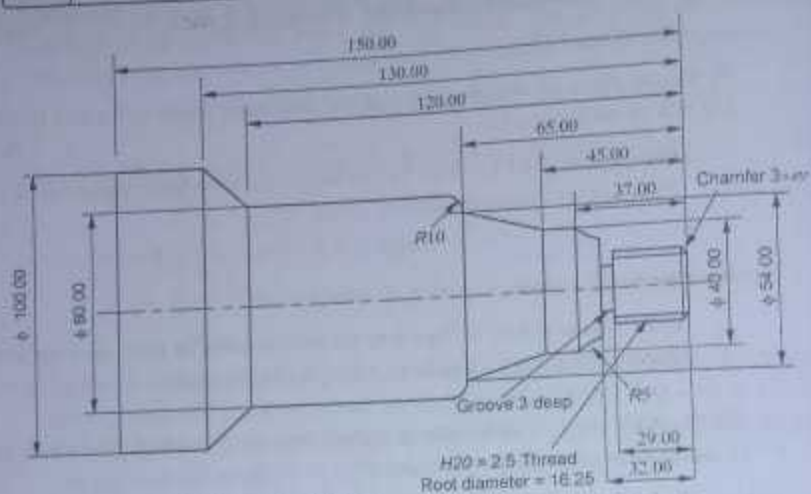
Same as AU Problem 4.5 in Page 4.153.

Or

- (b) With suitable sketches, explain the various FMS layout configurations prevalent today.

Refer chapter 5.19.2 in Page 5.57.

Q-6



Billet diameter = 110 mm

Billet length = 200 mm

All dimensions are in mm

Figure Q2